

SUBMISSION

Submission to the Department of Climate Change, Energy, the Environment and Water

Submission to the National Energy Workforce Strategy

13 September 2024

The Australian Academy of Technological Sciences and Engineering (ATSE) is a Learned Academy of independent, non-political experts helping Australians understand and use technology to solve complex problems. Bringing together Australia's leading thinkers in applied science, technology and engineering, ATSE provides impartial, practical and evidence-based advice on how to achieve sustainable solutions and advance prosperity.

Australia will need to grow its clean energy workforce by 40% by 2050 to around two million workers to meet the challenge of the net zero transition (Jobs and Skills Australia 2023), providing a huge opportunity for career transitions in communities that have traditionally supplied the fossil fuel energy workforce. The clean energy workers of Australia's future will be shaped through training and retraining Australians, and from skilled migration. Immigration can be a useful tool to address acute skills shortages but won't meet the workforce demand, particularly considering the expected global shortage of seven million green energy workers by 2030 (BCG 2023). This increased global competition for green energy workers will also put pressure on Australia's workforce through rising demand for Australian workers. To turn this to an advantage, Australia can prioritise investing in building its domestic clean energy workforce and inspiring the next generation of local workers to join the clean energy workforce – to fill domestic needs and create a potential export pipeline for expert international energy services. This massive workforce shift will require significant increases in the number of engineering students, as well as increases in those trained through the vocational education system in skills central to the energy sector – such as electricians and other technicians. The challenge is urgent: it takes at least several years to train and upskill new workers. To meet its own obligations and create opportunity, Australia must start this work of training and re-training now.

ATSE recommends the following actions to help build Australia's clean energy workforce:

Recommendation 1: Identify major forms of current and emerging clean energy technologies and develop specific plans for workforce development for each.

Recommendation 2: Ensure the National Energy Workforce Strategy includes investments in evidence-based diversity and inclusion programs in alignment with the Pathway to Diversity in STEM Review.

Recommendation 3: Work with State and Territory Governments to develop and implement a national strategy to increase the cooperation and integration of vocational education with high schools and the university sector.

Recommendation 4: Invest in green energy workforce development for communities built around coal and gas, including upskilling current energy workers and inspiring and educating the next generation in those communities to pursue clean energy careers.

Recommendation 5: Include in the National Energy Workforce Strategy provisions to better recognise and utilise the skills of migrant workers in the Australian workforce.

Required skills depend on the type of clean energy

The clean energy enabled workforce includes a range of skills and professionals that are common across all forms of electricity generation and storage - for example, skilled project managers, community engagement personnel and electrical engineers – that the National Energy Workforce Strategy will need to target. In addition, each technology also brings specific skills. For example, solar installation and maintenance is likely to rely heavily on skilled tradespeople, wind energy will require working at heights certifications, and nuclear power (should it become part of the future mix) requires highly educated nuclear engineers. Jobs and Skills Australia has identified 38 distinct occupations related to the clean energy workforce (Jobs and Skills Australia 2023). A single strategy that does not account for the individual skills needs of each form of clean energy will fail to appropriately support the workforce development of the clean energy sector.

The Strategy will also need to consider the needs of future clean energy generation, ensuring Australia has the workforce required to take advantage of emerging technologies that are not already present in the Australian market. Opportunities include green hydrogen fuels for generation and transport needs, with the development of hydrogen hubs across the country, emerging battery technologies for improved energy storage, increased integration of consumer energy resources, like bidirectional electric vehicle chargers, and potentially nuclear Small Modular Reactors¹, following commercial maturity in the late 2030s or early 2040s. The National Energy Workforce Strategy should include specific plans for each major form of currently used clean energy generation and for future technologies.

¹ For more information on the potential of Small Modular Nuclear Reactors, please see ATSE's report [*Small Modular Reactors – The technology and Australian context explained.*](#)

Recommendation 1: Identify major forms of current and emerging clean energy technologies and develop specific plans for workforce development for each.

Increasing workforce diversity to boost the talent pool

Inspiring the next generation to pursue mathematics, physical sciences and engineering at the secondary school and tertiary levels is essential to ensuring that Australia has a talent pipeline to draw upon as we transition towards a green energy led grid. Australia produces the fourth-lowest number of engineering graduates as a proportion of all graduates (8.55%) in the OECD (OECD 2024). The most direct way to increase engineering and related course enrolments is to rectify the clear gender imbalance in these courses in universities and vocational education and training (VET) providers. Girls only make up 27% of students in Year 12 physics, engineering and IT courses, and 37% of higher-level maths courses (DISR 2023). Only one-in-five (20%) engineering enrolments at university are women (Department of Education 2023), while only around one-in-ten (11%) engineering-related enrolments in VET are women (NCVER 2023). This below-parity enrolment rate gives rise to stark gender disparities within critical clean energy workforces – for example, women only account for 3% of electricians (Jobs and Skills Australia 2024).

Interventions are required across the entire educational cycle, from primary education, through to universities and VET providers. Implementing the recommendations of the [Pathway to Diversity in STEM Review](#) would support this work to grow and diversify the clean energy-enabled workforce. ATSE recommends a coordinated and evidence-based approach to STEM education, and equity and diversity programs. ATSE's [Elevate: Boosting Diversity in STEM](#) program assists women and non-binary people with scholarships, workshops and support services to help increase women studying STEM at university. Evaluated and proven effective, Elevate provides the support that scholars need to stay focused on their studies, while connecting them with the networks to support their career development as professionals and leaders. Expanding programs like these across all levels of education, including VET, will help to support greater diversity in the available STEM skilled workforce and increase the overall talent pool for employers to draw from.

Recommendation 2: Ensure the National Energy Workforce Strategy includes investments in evidence-based diversity and inclusion programs in alignment with the Pathway to Diversity in STEM Review.

Improving the status an integration of vocational education and training

Many of the skills needed for our future clean energy sector - technicians, machinists, electricians, fitters and more - will be taught by VET providers. VET-based training often has the advantage of being more hands-on and flexible in delivery, allowing for more agile responses to changing skills needs. This is vital when there is often a long lag between skills shortages being identified and the completion of education or training of new students to fill those shortages. However, the VET sector often suffers from a poor perception, with only 3% of students believing that their parents want them to undertake VET study – compared to 78% for university study (Year13 and YouthSense 2019). This is despite the growing demand for VET-taught skills and the higher wages some VET-taught fields provide. Linking vocational education and training to schools may help facilitate access to post-secondary education for those who may not have considered it, particularly those from traditionally underrepresented or disadvantaged backgrounds.

While VET is often sold to students as a pathway to university, the VET sector trains tens of thousands of university graduates each year (TAFE NSW n.d.), including people who enter the VET system in mid-career, making both VET a pathway to university and university a pathway to VET. As such, better integrating universities and VET providers will enable greater support to students taking these pathways, while also helping to break down hierarchical perceptions that place universities above VET providers in the minds of students and parents. A national integration strategy should be developed to take a coordinated approach to incorporating vocational education into our nation's secondary schools and universities. This

would also fulfil the recommendations of the Universities Accord² to align and create seamless pathways between universities and VET (O’Kane 2023).

Recommendation 3: Work with State and Territory Governments to develop and implement a national strategy to increase the cooperation and integration of vocational education with high schools and the university sector.

Building social licence for renewable energy through developing local skills

Regional communities built around fossil-fuel-based energy sources – primarily coal and gas – represent a huge opportunity to support the clean energy sector. Targeting these areas has two major advantages. Firstly, there are a large number of potential workers with skills that are transferrable to the clean energy workforce. These workers will require relatively less upskilling compared to other workers and, as coal and gas power plants are phased out, a large number of workers will be looking to transition to new jobs – providing a significant opportunity to grow the clean energy workforce. Secondly, supporting these workers with new, well paid, jobs will help develop community support for clean energy projects. Communities built around fossil-fuel-based energy are understandably some of the most nervous about the impact the green energy transformation, with their livelihoods on the line. By providing a clear workforce pathway from existing energy jobs to green energy jobs, the community can gain a sense of ownership and investment in these projects making the process of gaining community support simpler.

To help build this community support through workforce development two pathways need to work in parallel. Existing workers in traditional energy job need to be provided with a clear and easily accessible training and employment pathway to upskill and reskill for clean energy roles. This will need to involve training providers and employers working together to simplify and communicate pathways targeted at workers in traditional energy roles.

It will also require targeting the next generation of workers during their initial education and training. This should start in schools, with students familiarised with green energy technologies in science and technology classes. This should include familiarisation with the technology itself, as well as providing information about further education and career opportunities within the green energy sector. ATSE’s STELR program provides one example of how this might be achieved. STELR provides schools with hands-on, interactive, kits on sustainable topics, including renewable energy generation, to give students a chance to engage with the technology behind our clean energy future. This is supported by Shape Your Future resources that highlight green energy career pathways and allow students to access experts at the cutting edge of research and development.

Recommendation 4: Invest in green energy workforce development for communities built around coal and gas, including upskilling current energy workers and inspiring and educating the next generation in those communities to pursue clean energy careers.

Streamlining skills recognition for migrant workers

While migration alone cannot be counted on to solve the skills needs of the nation, and training local talent here in Australia needs to be a priority, migrants can play an important role in ensuring acute skills gaps are managed appropriately. Currently 58% of engineers in Australia were born overseas (Engineers Australia 2022a). However, skilled migrants can experience significant barriers to employment in Australia, that leading to unemployment or employment in roles below their skill level. For example, migrant engineers can struggle to have their international qualifications recognised, are disadvantaged by a lack of local networks and face visa restrictions (Engineers Australia 2022b). As a result, migrant workers are much less likely to work in-field in areas of crucial skills shortages, such as engineering (Engineers Australia 2022a). While Australia’s formal support for the UNESCO Global Convention of the Recognition of Qualification concerning Higher Education is an important step, more needs to be done to quickly recognise skills and qualifications obtained overseas and better utilise those skills in appropriate roles. With the development of

² Recommendation 37 of the Australian Universities Accord calls for “encouraging more cross-provision of VET by higher education providers, and vice versa, such that dual sector provision becomes commonplace”

a National Skills Taxonomy by Jobs and Skills Australia, mapping common skills needed in the clean energy sector to overseas qualifications may help to demonstrate equivalencies and help employers feel more comfortable with hiring workers trained overseas. Better solutions to help Australian businesses recognise overseas qualifications and experience are needed. [Engineers Australia Global Engineering Talent Program](#) provides one pathway, through an 18-week program that helps engineers who trained overseas get linked in with a local mentor and provides training on the Australian context. The Queensland Government is investing in 20 places in this program for their clean energy workforce. The Federal Government could consider investing in this, or a similar program, to help get the most out of our migrant engineer workforce.

Recommendation 5: Include in the National Energy Workforce Strategy provisions to better recognise and utilise the skills of migrant workers in the Australian workforce.

ATSE thanks the Department Climate Change, Energy, the Environment and Water for the opportunity to respond to the National Energy Workforce Strategy. For further information, please contact academypolicyteam@atse.org.au.

References

BCG (2023) *Will a Green Skills Gap of 7 Million Workers Put Climate Goals at Risk?*, <https://www.bcg.com/publications/2023/will-a-green-skills-gap-put-climate-goals-at-risk>, accessed 15 August 2024.

Department of Education (2023) *Selected Higher Education Statistics – 2022 Student data*, <https://www.education.gov.au/higher-education-statistics/student-data/selected-higher-education-statistics-2022-student-data>, accessed 16 August 2024.

DISR (2023) “Year 12 subject enrolment in STEM and other fields,” <https://www.industry.gov.au/publications/stem-equity-monitor/primary-and-secondary-school-data/year-12-subject-enrolment-stem-and-other-fields>, accessed 16 August 2024.

Engineers Australia (2022a) *Engineering skills - supply and demand Discussion paper*, <https://www.engineersaustralia.org.au/sites/default/files/2022-03/Engineers-Australia-Skills-Discussion-Paper-20220310.pdf>, accessed 31 January 2023.

Engineers Australia (2022b) *Strengthening the engineering workforce in Australia*, Canberra, <https://www.engineersaustralia.org.au/publications/strengthening-engineering-workforce-australia>, accessed 17 November 2022.

Jobs and Skills Australia (2023) *The Clean Energy Generation Workforce needs for a net zero economy Clean Energy Capacity Study*, <https://www.jobsandskills.gov.au/studies/clean-energy-capacity-study>.

Jobs and Skills Australia (2024) *ANZSCO 3411 Electricians*, <https://www.jobsandskills.gov.au/data/labour-market-insights/occupations/3411-electricians>, accessed 22 August 2024.

NCVER (2023) *NCVER DataBuilder*, <https://www.ncver.edu.au/research-and-statistics/data/databuilder#>, accessed 16 August 2024.

OECD (2024) “Tertiary graduates by field,” doi:<https://doi.org/10.1787/9af26c71-en>.

O’Kane M (2023) *Australian Universities Accord Final Report*, <https://www.education.gov.au/australian-universities-accord/resources/final-report>.

TAFE NSW (n.d.) *UNIVERSITY TO TAFE NSW*, <https://www.tafensw.edu.au/study/pathways/university-to-tafe>, accessed 3 February 2023.

Year13 and YouthSense (2019) *The TAFE Report: Changing Young People’s Perceptions of TAFE and Vocational Education*, <https://youthsense.com.au/research/>.